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ABSTRACT

Causal models of adolescent substance abuse from a family systems perspective are developed using data from a large-scale family therapy efficacy grant. It is argued that the literature on families of adolescent substance abusers is scattered in its theoretical and empirical efforts, tends to not account for individual and family developmental influences on adolescents' behavior, is laden with poor instrumentation, and tends to treat all drugs indiscriminately. In an attempt to address these concerns, a structural equation modeling approach incorporating systemic and developmental (individuation) perspectives on drug abuse is used in examining the impact of the family system on overall drug use severity, and tobacco, alcohol and marijuana use. The sample included 111 families of adolescent substance abusers representing families of youthful drug users typically seen in treatment. Overall, the family systems causal models explained significant proportions of variance in adolescent illicit drug use, but were not predictive of licit drug use; none of the family systems variables were predictive of the frequency of adolescent tobacco or alcohol use. Conversely, greater family cohesiveness and open family communication were negatively related to overall drug use severity and marijuana use. Democratic parenting styles were associated with greater marijuana use. Finally, there was a trend suggesting that clearer intergenerational roles predict less adolescent marijuana use. Propositions based on the findings are developed and directions for intervention-prompted changes in family functioning on adolescent drug use are offered. (Twelve tables, 9 figures, and 77 references are included). (Author)

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DIRECTIONS FOR THE IMPACT OF INTERVENTION-PROMPTED CHANGES IN FAMILY FUNCTIONING ON ADOLESCENT LICIT AND ILLICIT DRUG USE*

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ABSTRACT

Causal models of adolescent substance abuse from a family systems perspective are developed using data from a large scale family therapy efficacy grant. It is argued that the literature on families of adolescent substance abusers is scattered in its theoretical and empirical efforts, tends to not account for individual and family developmental influences on adolescents' behavior, is laden with poor instrumentation, and tends to treat all drugs indiscriminantly. In an attempt to address these concerns, a structural equation modeling approach incorporating systemic and developmental (individuation) perspectives on drug abuse is used in examining the impact of the family system on overall drug use severity, and tobacco, alcohol and marijuana use. The sample included 111 families of adolescent substance abusers representing families of youthful drug users typically seen in treatment. Overall, the family systems causal models explained significant proportions of variance in adolescent illicit drug use, but were not predictive of licit drug use. None of the family systems variables were predictive of the frequency of adolescent tobacco or alcohol use. Conversely, greater family cohesiveness and open family communication were negatively related to overall drug use severity and marijuana use. Democratic parenting styles were associated with greater marijuana use. Finally, there was a trend suggesting clearer intergenerational roles predict less adolescent marijuana use. Propositions based on the findings are developed and directions for intervention-prompted changes in family functioning on adolescent drug use are offered.

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INTRODUCTION

Traditionally, drug and alcohol abuse has been viewed as a problem of individuals possessing some type of personality defect and physical dependence (Clayton, 1979). Drug and alcohol abusers were seen as nonproductive members of society, deviating from the normal social realm, having no family attachments, and being victims of temptation (Fawzy, Wellisch & Coombs, 1984).

The recognition that drug and alcohol abuse is not simply a problem of individuals but a problem of families as well has gained impetus throughout the 1970's and 1980's (Glynn, 1984; Stanton & Todd, 1982). This change in philosophy is evident in the growing body of literature on the role of families in drug abuse. In addition, fueled by the premise that drug abuse is a progressive problem potentially leading to addiction (Frykholm, 1985; Ungerleider & Andrysiak, 1984), the examination of families with adolescent drug and alcohol users has shown a tremendous increase. Yet, the literature on families of adolescent drug abusers remains somewhat scattered in its theoretical and empirical efforts.

While the literature on adolescent substance abuse in the context of the family has grown tremendously over the last two decades, it remains deficient in a number of ways. Perhaps the most glaring weakness is the lack of integration and synthesis apparent in the empirical literature. This lack of integration is pronounced when other weaknesses are considered. First, common to the literature on families and drug abuse in general, the role of the family has been limited to broad generalizations about across generation usage and modeling by parents and other family members. In addition, broad, static indicators of emotional closeness and rigidity in role structures have been employed. Second, a consistent emphasis on normal developmental processes characteristic of the "families with adolescents" and "launching" stages of the family life cycle is lacking (an exception is Todd, 1988). Finally, there is a tendency to treat all drugs indiscriminately rather than examining the unique attributes of using specific drugs or classes of drugs. Where drug types are differentiated, such attempts do not incorporate notions of the family life cycle and normal family processes.

The broader goal of this paper is to develop hypotheses about the effectiveness of family-based interventions for various forms of drug use by drug abusing adolescents. To achieve this end, a LISREL modeling approach is used to examine the impact of family structural, dynamic and developmental factors on the overall drug use severity and tobacco, alcohol and marijuana use of adolescents with a sample of adolescent drug abusers and their families.

DRUG ABUSE AND ADOLESCENT DEVELOPMENT IN THE FAMILY

One major flaw in this area of inquiry is the failure to

incorporate theories of adolescent development in the context of the family when researching adolescent substance abuse (Levine, 1985). Sabatelli and Mazor (1985) suggest that the concept of individuation helps join together the individual development literature on identify formation (e.g., Erikson, 1968) and the family systems literature on differentiation (Bowen, 1976; Minuchin, 1974; Hess & Handel, 1976; Olson, Sprenkle & Russell, 1979). Individuation is seen as the process of increasing psychological distance and separateness through which identity (as defined by Erikson, 1968) is established. Differentiation, in contrast, is a property of family systems ranging from poorly differentiated to well differentiated. Clearly, in the context of this integrated approach the "pseudo-individuation" of the drug abusing adolescent member characteristic of the "homeostatic model" suggests a poorly differentiated family that hinders the individuation process and the formation of the adolescent's identity separate from the family. Grotevant and Cooper (1986) provide a model of individuation in the family that specifies the interplay of individuality and connectedness in dyadic relationships. The key to individuated relationships is the co-occurrence of at least moderate levels of individuality and connectedness for the participant members.

A model of adolescent individuation is presenting in Figure 1. In Figure 1, individuality and connectedness are expressed as dimensions of adolescent individuation from the family, with individuality as the vertical axis and connectedness as the horizontal axis, both dimensions ranging from low to high. In this model, high degrees of individuality and connectedness are necessary for an "individuated relationship." Low individuality and high connectedness indicates an enmeshed dyadic relationship, where adolescents are not engaged in identity exploration behaviors and are emotionally connected to their families.

High individuality and low connectedness suggests the situation of "pseudo-individuation," or artificial separateness of adolescents from their families. Finally, adolescents low on individuality and low on connectedness are considered anomic, or absent of strong family ties, not engaging in identify exploration behaviors, and, following Marcia's (1966) typologies, are identity diffused (i.e., uncommitted and not currently exploring identity issues).

Following Figure 1, adolescent substance abuse can be viewed in the context of poorly individuated dyadic relationships characterized by a lack of simultaneously high individuality and connectedness between members. The concept of "pseudo-individuation" implies the presence of individuality and at the same time implies a lack of relational connectedness with the parent(s). The illusion of independence for the adolescent is achieved through the use and abuse of drugs, behaviors which are meant to enhance individuality. Yet, the abuse is in reaction to a rigid family system, a system that maintains a homeostatic balance by focusing on the abuse, and is related to a lack of connectedness necessary for healthy family functioning. The individuation process, then, is comprised of frequent and at times dramatic attempts at establishing an identity by the adolescent and resistance by the parents in the presence of a lack of healthy connectedness between the members. The parent-child relationships are not poorly individuated due to a lack of individuality and separateness, rather the relationships are

poorly individuated because of a lack of connectedness in a mature and healthy sense between the parents and the drug abusing adolescent.

CONCEPTUAL MODEL AND RESEARCH QUESTIONS

The conceptual model proposed here is in part restricted by the limitations of the data used in this study. First, the empirical and theoretical literature argues for the role of parental substance abuse causing drug abuse in child members through modeling or biological susceptibility transmitted intergenerationally. The low attendance rates of the parents at the pre-assessments, and particularly the fathers, along with the large number of divorced parents raises serious questions about the validity of the parents' drug use data. Thus, a variable on parental use is not included in the model.

Second, there is no indicator of individuality or identity status of the adolescents in the data set. There is, though, a measure of family cohesiveness (i.e., the FACES III cohesion subscale) that will allow for at least a partial test of the role of adolescent individuation from the family for families with adolescent substance abusers. The assumption is made here that family cohesion as measured by FACES III is synonymous with connectedness as employed in the individuation model depicted in Figure 1. Finally, the design is cross-sectional and temporal precedence is asserted rather than established through the design.

The conceptual model for this project is depicted in Figure 2. This family systems model includes a number of antecedent demographic variables that have been identified in the literature as related to drug use. The direction of each relationship is given in parentheses. The family system variables are those identified by Olson, Sprenkle and Russell (1979) as central parameters of healthy family functioning, and all are related to adolescent drug use according to empirical accounts. The adolescent's communication with the parents has a direct effect on drug use as well as an indirect effect through both adaptability and cohesion. Thus, it is assumed that the communication between the adolescents and parents as information exchange (Watzlawick, Beavin, & Jackson, 1967), regulates and maintains the more structural family parameters of cohesion and adaptability.

The preceding review suggests the following research questions:

1. How do various family structural characteristics relate to the use of different drugs (or classes of drugs) by adolescents?
2. How does the process of individuation of adolescents from their parent(s) relate to the use of different drugs (or classes of drugs) by adolescents?

Four specific hypotheses are tested in this paper:

1. The greater the family disengagement and rigidity, and poorer the communication, the greater the overall drug use severity by the adolescent drug using member.
2. Family cohesiveness, adaptability, and communication will not be associated with the frequency of tobacco use by the adolescent drug using member.
3. The greater the family disengagement and rigidity, and poorer the communication, the greater the frequency of alcohol use

by the adolescent drug using member.

4. Family cohesiveness, adaptability, and communication will not be associated with the frequency of marijuana use by the adolescent drug using member.

METHOD

The subjects for this study included 152 drug using adolescents and their families participating in the National Institute on Drug Abuse funded project "Family Therapy for Adolescent Substance Abuse." The project examines the efficacy of family focused interventions for adolescent substance abuse, specifically the Purdue Brief Family Therapy and Training in Parenting Skills programs, compared to treatment-as-usual modalities employed by cooperating agencies. A total of 152 adolescents who were identified by professionals as having drug problems were referred to a drug rehabilitation program by juvenile judges, probation officers, school administrators, police and other community sources. Eligibility criteria for inclusion in the study included: a) the adolescent must be between 13 and 19 years of age (this range was expanded to 12 and 22), b) the adolescent's use or abuse of drugs be at least three months in duration, and c) if marijuana was the only drug used, a frequency of use must be no less than three times a week for a three month period. While the reason for referral often involved various forms of acting out (e.g., theft, running away, truancy), involvement with drugs and alcohol was the primary prerequisite for adolescents' referral to the project.

The adolescents and their families participated in a pre-intervention assessment to collect baseline data for assessing treatment efficacy. The assessment included the completion of self-report measures, projective tests, and video-recorded problem-solving tasks by family members. Urine samples were obtained from the adolescent IPs and a younger sibling at the time of the assessment. Drug use self-reports were treated as confidential and only the research staff had access to this data.

Demographic characteristics of the sample are given in Table 1. As Table 1 shows, the average age of the adolescents was 16.2, roughly juniors in high school, with a range of 12 to 22 years. About four out of five participating adolescents were male (80.3%, or 122, versus 19.7%, or 30 females). Further demographic information is given in the table.

One limitation of this study is that the sample is not representative of families with adolescent members, nor of families with adolescent substance abusers. Yet, the sample appears representative of the breadth of families with adolescent substance abusers that are referred for treatment. Table 2 gives percentages of school and work related problems experienced by the adolescents during a one-month period prior to the assessment. Figure 3 compares 30-day prevalence rates of drug use for the NIDA project adolescents with norms from "The Monitoring the Future" project, an ongoing national survey of drug use patterns among high school seniors, college students and young adults (Johnston, O'Malley & Bachman, 1988). Table 2 and Figure 3 suggest that these adolescents experienced a variety of school and work related problems and used

hard and soft drugs at rates higher than adolescents on the average.

Instrumentation

Poly-drug Use History Questionnaire. Self-report data on drug use by the adolescents was obtained using the Poly-drug Use History Questionnaire (Lewis, Conger, McAvoy, & Filsinger, 1979). The questionnaire assesses the frequency of use over the last four weeks of 14 drugs or classes of drugs. Measures of self-reported drug use by adolescents are considered valid and reliable by a number of authors (Johnston & O'Malley, 1985; King, 1970; Needle, McCubbin, Lorence, & Hochhauser, 1983; Single, Kandel, & Johnson, 1975). For the purposes of this analysis, concurrent urinalysis for the presence of cannabis was compared with self-reports of marijuana use yielding a "fib rate" (indicating non-use while testing positive for cannabis in the urine) of 4.5% and lending support for the validity of the Poly-drug Use History Questionnaire.

Data from the Poly-drug Use History Questionnaire on the project adolescents' reported drug use are given in Table 3. The most frequently used drugs or drug classes were alcohol (74% reported use), tobacco (67.3%), and marijuana (61.9%). Of the other drugs, only methadone was not reported as used by any of the adolescents. Data for the individual drug or drug classes (excluding tobacco) was collapsed into two groups: soft drug users (alcohol and marijuana), including 68.7% of the adolescents, and hard drug users (all other drugs), including 31.3% of the adolescents.

Family Adaptability and Cohesion Evaluation Scales, FACES III. FACES III is a popular diagnostic and evaluation tool developed by David Olson and his associates for use in family research and therapy (Olson, Portner, & Lavee, 1985). Consistent with the theoretical tenants of the Circumplex Model of Marital and Family Systems (Olson, Sprenkle & Russell, 1979), FACES III measures the degree of cohesiveness and adaptability of a family. The authors hypothesize that moderate levels of cohesion and adaptability are associated with healthy family functioning while extreme levels, high or low, are associated with greater pathology (Olson, Sprenkle & Russell, 1979).

Parent-Adolescent Communication Inventory, PACI. The PACI, adolescent version, (Barnes & Olson, 1982) was used as a measure of the effectiveness of communication between the parents and adolescents. In addition to the total scale, the PACI has two subscales: a) problem family communication, and b) open family communication. Each subscale and the total scale is scored for communication between the adolescent and mother, and between the adolescent and father.

Confidential Client Intake Form. The child and parent versions of the Confidential Client Intake Form, CCI, was completed by each child member and adult, respectively, at the time of the pre-intervention assessment. Each version of the form contained typical demographic information including age, gender, occupation, family income, level of educational attainment, religious affiliation, strength of religious beliefs, and residence. In addition, the parent version included questions on marital status, number of times married and divorced, age at first and last

marriage, number, gender and age of children, previous counseling, and grandparents' substance abuse.

Descriptives

Descriptives for the observed variables are given in Table 4. Due to missing data, the sample was trimmed to 111 cases. No differences were found between the trimmed sample and 41 cases with missing data on a number of indicators. None of the indicators differed from normality beyond the guidelines suggested by Huba and Harlow's (1986, 1987) work on the robustness of maximum likelihood estimation.

As depicted in Table 4, age was normally distributed (skew and kurtosis close to zero) and ranged from 12 to 21. Gender was a dichotomous variable, with females given a value of 0 and males a value of 1. Adolescents' strength of religious beliefs were scored on a five point Likert-type scale (ordinal in level of measurement), with values of 1 "Anti-religious," 2 "Not religious," 3 "Slightly religious," 4 "Moderately religious," and 5 "Strongly religious." The biological/adoptive parents' relationship status was a dichotomous variable with a value of 1 indicating "stability" (parents are married to each other), and 0 indicating "other" (parents not married to each other). A total of 59 cases were coded "stable," and the remaining 52 coded as "other."

Family income was an ordinal level variable, with a slightly flat distribution and minimal negative skew. The range of scores was from 1 "no income," to 9 "over $75,000."

Family cohesion is inherently ordinal although FACES data is often treated as interval level. The other FACES dimension, adaptability, was represented by 6 items from the 10 item scale. Exploratory analyses indicated that the subscale items were not unidimensional and tended to load on three non-orthogonal dimensions. Six of the items were retained as multiple indicators in the final model analyses and are given in Figure 4. The two Parent-Adolescent Communication subscales, both scored for communication with mothers and fathers, also deviated minimally from normality.

The drug use indicators were all ordinal level variables. Alcohol, tobacco and marijuana were all scored on seven-point Likert scales, with the frequency of use values including 0 "zero," 1 "1-2 times," 2 "3-5 times," 3 "6-9 times," 4 "10-19 times," 5 "20-39 times," and 6 "40 or more times."

Overall drug use severity, measured as the Index of Drug Severity or IDS (Piercy, Lewis, Sprenkle, Trepper, & Volk, 1988), is a weighted composite of Poly-drug Use Questionnaire item scores reflecting both the severity of using particular drugs and the frequency of use. The drug use severity weights and frequency of use weights are given in Table 5. Scoring for the IDS involves multiplying each severity weight by its corresponding frequency of use rate, and then summing the products.

Unreliability of Single-Indicators

Many of the variables included in the conceptual model are measured as responses to single items or sums of items in the

questionnaires. The use of single indicators of latent variables is problematic in that the variance of any given indicator is error laden to the extent that responses are unreliable. A solution to the problem of error laden single indictors involves the estimation of the proportion of reliable and unreliable variance for each indicator, and partitioning the unreliable portion from the ~~latent~~ observed variable leaving only reliable "error free" variance for estimation of causal relationships (Hayduk, 1987). Estimates of reliable and unreliable variance for the single-indicators are given in Table 6.

Error rates for Age, Gender, Strength of Religious Beliefs, Biological/Adoptive Parents' Relationship Status, and Family Income were based on inconsistencies in responses to questionnaire items. Error rates for Parent-Adolescent Communication and Family Cohesion were computed using Cronbach's alpha as an indicator of reliability or internal consistency of the scales.

Estimating the reliability of self-reported drug use by the project adolescents is a crucial aspect of this project. Two sources of information were used to estimate the reliability of drug use self-report: a) previous reliability studies, and b) concurrent urinalysis from the NIDA project. A review of the literature on validity and reliability of drug use self-reports suggests that reliability is not consistent across drugs or drug classes. For tobacco, inconsistency rates, defined as indicating use over the last 30 days while also indicating no life-time use of the same drug, never exceeded 1% (Needle, et al., 1983). Furthermore, tobacco is not an illicit drug and investments in under-reporting use should be minimal (Single et al., 1975). Reliability estimates from the O'Malley, Bachman and Johnston (1983) article ranged from .88 to .91. The average of these estimates was taken and the proportion of unreliable variance for tobacco use estimated at 10%.

Alcohol use inconsistency rates never exceeded 1% (Needle, et al., 1983). Test-retest correlations for wine use and hard liquor use were quite low, ranging from .27 to .34 for wine use, and .34 to .60 for hard liquor use (Needle, et al., 1983). These correlations suggest haphazard reporting of wine and hard liquor use and possibly great variation in such use over relatively short periods of time. Consistency, defined as present use not less than previous use, was quite high at about 90% for wine use, 92% for beer use, and 93% for liquor use (Needle, et al., 1983). Yet, reliability estimates from the O'Malley et al., study ranged from a low of .72 to a high of .78. One explanation of the low reliabilities for alcohol use is that infrequent users tend to account for a large proportion of inconsistencies in drug use (Single et al., 1975), and that the samples for these studies indeed include large numbers of infrequent alcohol users. Based on the high consistencies, alcohol not being an illicit drug for adolescents of legal age for consumption, and possible unreliability of alcohol use due to varying responses from infrequent users in the studies reported here, the proportion of unreliable variance in tobacco use was estimated at 15% for this study.

In addition to relying on previous reliability studies, the reliability of marijuana self reports was assessed by concurrent urinalysis for cannabis at the time of the pre-intervention assessment for the NIDA project adolescents. Marijuana use is appropriate for reliability checks using urinalysis in that cannabis

is detectable in the urine up to four weeks after consumption, the same time interval used in the Poly-drug Use Questionnaire. Concurrent urinalysis for cannabis yielded a "fib rate" (indicating on the drug use questionnaire not using marijuana while testing positive for cannabis in the urine) of 4.5%.

Inconsistency of marijuana use, defined as 30-day use not exceeding life time use, was only .2% (Single et al., 1975). Consistency across time, defined as present use not less than previous use, ranged from 93.5% to 97.3% (Needle et al., 1983). Estimates of marijuana self report reliabilities ranged from .79 to .84 (O'Malley, Bachman, & Johnston, 1983). Based on the low fib rates from concurrent urinalysis for this sample, high consistency rates, and moderate to high reliability estimates, the proportion of unreliable variance in marijuana use was estimated at 15% for this study.

Finally, the proportion of unreliable variance in overall drug use severity was estimated at 20%. The Index of Drug Severity includes all drugs listed on the Poly-drug Use Questionnaire, and thus included licit as well as illicit drugs. O'Malley et al. (1983) report reliability estimates ranging from .47 to .72 for illicit drug use. Given that only about 1/3 of the project adolescents reported using any hard drugs, and reliabilities for tobacco and alcohol use are high, the 20% estimate seems justified.

RESULTS

The hypothesized causal model of adolescent substance abuse in the context of the family was tested for overall drug use severity, and then for each of the three specific drugs of interest--i.e., tobacco, alcohol and marijuana use. The first step in the model testing process is to specify the hypothesized causal relationships in terms of a series of structural equations and pattern matrices representing the causal structure of the model (Lavee, 1988).

Figure 5 is the hypothesized model of adolescent substance abuse for this study re-expressed in LISREL symbols. Note that there are nine observed exogenous indicators denoted as x_1 through x_9. Age (x_1), gender (x_2), strength of religious beliefs (x_3), parents' relationship status (x_4), and income (x_5) each load singularly on separate latent variable, denoted as ksi_1 through ksi_5. The latent variables for income (ξ_5) and parents' strength of religious beliefs (ξ_4) are correlated according to the model. ξ_1, "Open Family Communication," and ξ_2, "Problem Family Communication," are correlated and each has two indicators. Also, several residual, error term correlations are allowed. The measurement model for the communication variables represents a confirmatory factor model for the two parent-adolescent communication subscale scores for communication with each parent.

There are eight observed endogenous indicators denoted as y_1 through y_8. Cohesion (η_1) and the adolescent's drug use (η_4) are both single-indicator latent variables. "Intergenerational Democracy" and "Hierarchical Ambiguity" are the adaptability factors, each having three indicators, and are denoted by η_2 and η_3, respectively. Correlated residual variances between y_6 and y_2 are allowed.

Not depicted in Figure 5 are the factor loadings for each measurement model. The loadings for each of the single-indictor latent variables are set to 1 and the corresponding diagonal elements in the theta matrices are set to the proportion of estimated unreliable variance as discussed in the previous section on unreliability of single-indicators. By setting the loadings to 1 all reliable variance is retained in the exogenous and endogenous concepts resulting in disattenuated parameter estimates. Also, for each multiple-indictor latent variable one of the factor loadings is fixed to a value of 1. This procedure sets the metric for the latent variables of interest (Hayduk, 1987).

The unexplained variances of the endogenous concepts (the variance not explained by the model) are denoted by ζ_1 through ζ_4 and constitute the diagonal elements of the psi matrix. None of the unexplained variances are correlated in the model.

The paths from the exogenous concepts to the endogenous concepts are depicted as gammas (γ). Note that each exogenous concept predicts drug use (η_4) according to the model, age (ξ_1) predicts family cohesion and "Intergenerational Democracy" (η_2), and the communication concepts (ξ_2 and ξ_3) both predict the adaptability factors (η_2 and η_3) as well as cohesion (η_1). Finally, the paths from endogenous concepts to other endogenous concepts are depicted as betas. The only hypothesized beta paths are from the adaptability factors and cohesion to the drug use latent variable (β_{41}, β_{42}, and β_{43}).

Baseline Models

One approach to assessing the goodness-of-fit of a hypothesized causal model is to establish a baseline model where the researcher makes certain statements, in structural equation form, concerning the relationships among the variables of interest. The baseline model then serves as a basis for incremental and overall comparison with the hypothesized model in discerning goodness-of-fit.

Two complementary baseline models and fit indices are employed here. First, a null baseline model following Bentler and Bonett (1980) is proposed where the relationships among the variables are set to zero and thus represent a "know nothing" specification of the model. The chi-square value for this model then serves as a baseline for comparison of all hypothesized model and the degree of improvement, expressed as a proportion of the total chi-square, is computed as the Normed Fit Index, or NFI.

A second baseline model, following Sobol and Borenstadt (1984), is the informed null model and represents that state the of literature at any given time. For the purpose of these analyses, the informed baseline model is a "pseudo-regression" model where all variables predictive of adolescent substance abuse are included, but the interrelationships are set to zero (not estimated) in accord with the literature. The statistic computed in the Informed Normed Fit Index, or INFI.

Model Building

Tables 7 through 10 give goodness-of-fit and lack-of-fit indicators for the null models, hypothesized family systems model,

and modified family systems models for overall drug use, tobacco use, alcohol use, and marijuana use. The hypothesized model proved a poor fit to the data as suggested by the significant overall chi-square values. Thus, attention was turned to modification of each model.

Modification indices, standard errors, normalized residuals and t-values were all used an indicators of mis-specification and stress within the models. For all four initial models, the modification indices indicated that freeing the path between cohesion and "Intergenerational Democracy" would greatly improve the fit of the models. Interestingly, the modification index was identical for the paths from cohesion to "Intergenerational Democracy" and from "Intergenerational Democracy" to cohesion. Based on the Circumplex Model and the family life cycle literature (Olson, McCubbin, & Associates, 1983), the path from "Intergenerational Democracy" to cohesion (element BE(1,2)) was freed for estimation.

Freeing the path from "Intergenerational Democracy" to cohesion improved the fit of the models as evidenced by the statistically significant change in chi-square nested model comparisons. Yet, modification indices suggested further stress in the Beta matrix (i.e., the matrix containing path coefficients among the endogenous concepts). The modification indices suggested that freeing the path between "Intergenerational Democracy" and "Hierarchical Ambiguity" would improve the fit of the models. The decision was made to treat "Hierarchical Ambiguity" as dependent on "Intergenerational Democracy," and hypothesize that greater input from children in family decision-making is predictive of ambiguous intergenerational relationships.

Freeing the path from "Intergenerational Democracy" to "Hierarchical Ambiguity" (element BE(3,2)) improved the fit of the model as again the change in chi-square was significant. While the overall chi-square test was non-significant for the marijuana use model, the other indicators of fit suggested further modification would enhance the fit of the model to the data. Modification indices suggested freeing the path from parents' relationship status to "Intergenerational Democracy" (element GA(2,4)), indicating that the degree of children's input in decision-making is different for stable, two-parent parent families than other families.

While the overall chi-square test for each model reached non-significance after this latest modification, the small sample size (111 families) warranted caution in relying solely on this test for discerning acceptable fit. Because of the threat of underfitting, further modifications of the models were allowed. The modification indices suggested freeing a path from the adolescent's strength of religious beliefs to family cohesion (element GA(1,3)). The nested model comparisons indicated that this modification proved a better fit, yet stress was still apparent in the phi matrix (i.e., the matrix containing the variances and covariances of the exogenous variables). Specifically, the correlation between age and Open Family Communication was freed (element PH(6,1)). Again, the nested model comparisons indicated that this final model was a better fit. Furthermore, the overall chi-square values were non-significant, and the GFI, AGFI and RMSR were all acceptable. No further modifications through freeing parameters were conducted for the models.

Path coefficients of less than .05 were set to zero and the models re-estimated. These final parsimonious family systems models for adolescent drug use severity, and tobacco, alcohol and marijuana use are given in Figures 6 through 9, respectively. All parameter estimates reported in the figures are standardized and bounded by -1 and +1. The total, direct and indirect effects of the predictor variables on the drug use latent variables are given in Table 11. Effects may be interpreted as the amount of change in drug use expected, either directly from the predictor or indirectly through other variables, given a one unit change in the predictor variable while holding everything else in the model constant (Hayduk, 1987). Finally, standardized parameter estimates for the entire model, including structural and measurement models, for each of the four models are given in Table 12.

Of great interest is the difference in the portion of variance explained by the predictors for each of the types of drug use tested. The overall R^2 for drug use severity is .239, compared to .111 for tobacco use, .069 for alcohol use, and .301 for marijuana use. In other words, the family systems model explains about one-quarter of the variance in drug use severity, about one-tenth the variance in tobacco use, slightly over one-twentieth of the variance in alcohol use, and almost one-third the variance in marijuana use. In general, the differences in amounts of variance explained by the predictors tend to support hypotheses one and two, and not support hypotheses three and four. Examination of each model separately, though, is necessary to evaluate the hypotheses fully.

Hypothesis One stated that "The greater the family disengagement and rigidity, and poorer the communication, the greater the overall drug use severity by the adolescent drug using member." Mixed support was found for this hypothesis, as is evident in Figure 6. As expected, family cohesion is negatively related to drug use severity, and the total effect is direct. The two adaptability factors are positively related to drug use severity, though neither differs statistically from zero. There are indirect effects of "Intergenerational Democracy" on drug use severity through family cohesion and through "Hierarchical Ambiguity." "Open Family Communication" is negatively related to drug use severity and "Problem Family Communication" is positively related to drug use severity, as expected, but neither coefficient differs statistically from zero. Yet, there are sizable indirect effects of "Open Family Communication" on drug use severity through family cohesion, through "Intergenerational Democracy," through "Hierarchical Ambiguity," and through "Intergenerational Democracy" and "Hierarchical Ambiguity." This finding suggests that while change in the openness of family communication will directly result in only minimal change in drug use severity, its effect through change in family cohesion and adaptability is considerable.

Hypothesis Two stated that "Family cohesiveness, adaptability and communication will not be associated with the frequency of tobacco use by the adolescent drug using member." As Figure 7 demonstrates, there is general support for this hypothesis. Again, the proportion of variance in tobacco use explained by the predictors is slightly over 11%. Family cohesion has no effect, direct or indirect, on the frequency of tobacco use. "Intergenerational Democracy" and "Hierarchical Ambiguity" both have

small negative effects on tobacco use, but neither are statistically significant. The trends suggest that greater ambiguity in family roles and, more importantly, greater input of the children in family decision-making (the total effect of "Intergenerational Democracy" on tobacco use is -.14) predicts lower tobacco use. The communication latent variables both have small direct effects on tobacco use although both are in a direction suggesting that more optimal family communication is associated with lower tobacco use. The total effect of "Open Family Communication," though minor, is the largest of any of the predictors at -.18.

Hypothesis Three stated that "The greater the family disengagement and rigidity, and poorer the communication, the greater the frequency of alcohol use by the adolescent drug use member." As can be seen in Figure 8, minimal support was found for this hypothesis. Family cohesion is negatively associated with the frequency of alcohol use, but again the coefficient does not differ statistically from zero. The trend, though, does confirm the hypothesis for family disengagement. "Hierarchical Ambiguity" is not predictive of alcohol use, and "Intergenerational Democracy" has a very small, indirect effect on alcohol use through family cohesion. The paths from the communication latent variables to alcohol use are contradictory, with "Open Family Communication" and "Problem Family Communication" negatively related to the frequency of alcohol use. Again, neither coefficient is statistically different from zero. The total effect of "Open Family Communication" on alcohol use, the largest effect of any predictor, suggests that the more open the family communication, the less the alcohol use by the adolescent member.

Hypothesis Four stated that "Family cohesiveness, adaptability, and communication will not be associated with the frequency of marijuana use by the adolescent drug using member." This hypothesis was generally not supported, as depicted in Figure 9. The path from family cohesion to marijuana use is sizable and in a direction indicating that greater family cohesiveness is associated with less frequent marijuana use. The total effect of family cohesion on marijuana use is entirely direct. "Intergenerational Democracy" also has a large direct effect on marijuana use, indicating the greater input from children in family decision-making is associated with greater marijuana use the by adolescents. In other words, more democratic parenting styles predict greater marijuana use. It must be noted, though, that the total effect of "Intergenerational Democracy" on marijuana use (.363) is considerably smaller than the direct effect (.711). Thus, while there is indeed a significant positive relationship between "Intergenerational Democracy" and marijuana use, the direct effect is somewhat misleading in that it is about twice the total effect given the negative indirect effects of "Intergenerational Democracy" on marijuana use through "Hierarchical Ambiguity" and through family cohesion. There is a small, non-significant path from "Hierarchical Ambiguity" to marijuana use suggesting a trend of greater ambiguity in family roles predictive of greater marijuana use. "Open Family Communication" has a small, non-significant negative association with marijuana use while "Problem Family Communication" is not related to marijuana use. The total effect of "Open Family Communication" on marijuana use is worth noting at -.20.

The effect of age on drug use is consistent across drug use variables and small in magnitude. Each model indicates that as the adolescents grow older drug use increases. The effect of age on drug use is primarily direct although there is an indirect effect through "Intergenerational Democracy" on drug use severity, tobacco use and marijuana use, an indirect effect though "Intergenerational Democracy" and "Hierarchical Ambiguity" on drug use severity, tobacco use and marijuana use, and an indirect effect through "Intergenerational Democracy" and family cohesion on drug use severity, alcohol use and marijuana use.

Gender is also consistently related to drug use indicating greater drug use for males compared to females. The largest path coefficient, .21, is from gender to marijuana use. All effects of gender on drug use are direct. Left unexamined are the possible effects of gender interactions with other demographic and family systems variables. The most powerful test of different models for males and females would involve a multi-sample technique (Joreskog & Sorbom, 1986), where sufficient numbers of male and female drug users are sampled and models compared statistically.

A curious findings is that adolescent's strength of religious beliefs is positively associated with overall drug use severity, tobacco use and marijuana use. While the magnitude of the paths are small, with the largest being .201 for the marijuana use model, the direction of the relationships indicate that greater religiosity predicts greater drug use for all ~~indicators~~ drugs other than alcohol. There is an indirect effect of adolescent's strength of religious beliefs through family cohesion on overall drug use severity, alcohol use and marijuana use.

The biological/adoptive parents' relationship status was negatively related to drug use severity and tobacco use, and positively related to alcohol use and marijuana use. None of these paths exceeded .10. The findings hint that greater marijuana use and alcohol use are characteristic of stable, two-parent families, while the opposite is true for overall drug use severity and tobacco use. There is an indirect effect of parents' relationship status on overall drug use severity, tobacco use, and marijuana use through "Intergenerational Democracy," an indirect effect on drug use severity, tobacco use and marijuana use through "Intergenerational Democracy" and "Hierarchical Ambiguity," and an indirect effect on drug use severity, alcohol use and marijuana use through "Intergenerational Democracy" and family cohesion.

Family income is negatively related to overall drug use severity, tobacco use, and alcohol use suggesting that the greater the income, the less the drug use. Income is not related to marijuana use by adolescents. The path coefficients are all similar at about -.11, and thus the impact of income on drug use, other than marijuana use, is quite small. There are no indirect effects of family income on drug use.

As would be expected given the nature of the models tested (with the only difference in models being the type of drug use examined), relationships among the exogenous variables and endogenous family system variables, and among the endogenous family systems variables are essentially equivalent across models. The path from the parents' relationship status to "Intergenerational Democracy" is about -.30 indicating greater input from children in

family decision-making in families where the biological/adoptive parents are not married. The adolescent's strength of religious beliefs was positively related to family cohesion, as expected. Age, though, was negatively related to "Intergenerational Democracy" and not statistically different from zero.

The family systems variables were related in a number of interesting ways. First, "Open Family Communication" was highly predictive of "Intergenerational Democracy" with more open communication associated with greater involvement of children in family decision-making. "Open Family Communication" was negatively related to "Hierarchical Ambiguity," although this relationship was not statistically significant. "Open Family Communication" was also positively related to family cohesion, again as expected. "Problem Family Communication," on the other hand, was not significantly predictive of any other family systems variable, although its correlation with "Open Family Communication" was about -.33. A path coefficient of -.22 was found for "Hierarchical Ambiguity" predicted by "Problem Family Communication." Finally, "Intergenerational Democracy" was significantly predictive of family cohesion and "Hierarchical Ambiguity" indicating that the more children are involved in family decision-making, the greater the family cohesiveness and the more ambiguous the intergenerational roles.

DISCUSSION

The general research questions of this study involve the relationship of family systems and the process of individuation of the adolescent from the family of origin to the use of various drugs by adolescent drug users. The second of these questions will be discussed first. This second question addresses a weakness in the literature on families of adolescent drug users in failing to attend to normative and non-normative, individual and familial developmental influences on adolescents' behavior.

The data for this study allowed for a partial evaluation of a conceptual model of adolescent individuation. There is no indicator of individuality and identity formation in this data set. It is assumed that the FACES III cohesion subscale scores represent the degree of connectedness among family members, and, hence, pseudo-individuated adolescent drug abusers should score low on this scale. Furthermore, greater drug use should be associated with lower cohesion scores. These hypotheses are supported for adolescents' drug use severity and marijuana use, with substantial negative paths from family cohesion to the drug use severity and marijuana use latent variables. Family cohesion was not associated with tobacco use and alcohol use. Thus, at least partial support of the notion that drug use covaries with greater emotional distance between adolescents and their families for illicit drug use, but not for alcohol or tobacco use. What the models did not test is whether or not the relationship between the adolescents and parents are pseudo-individuated (high on individuality for the adolescents) or the adolescents are identity diffused and anomic (low on individuality for adolescents). The partial support for the individuation model for illicit drug use by adolescents, however, cannot be generalized to support for the notion on pseudo-individuation of adolescent drug users from their families. A further examination of this issue with

measures of adolescent identity formation and status, and measures of dyadic connectedness with the family are necessary to fully evaluate the viability of the individuation model.

Support for the individuation conceptual model suggests that licit drug use, regardless of the frequency of consumption, is not related to extreme emotional distance among family members. It may be that alcohol and tobacco consumption are part of normal adolescent development for many adolescents and are not predicted by dysfunctional processes of individuation during the launching stages of the family life cycle. Adolescent development leaves the norm when extreme emotional distance among family members is present with such low connectedness predictive of greater illicit drug use. While alcohol and tobacco are considered gateway drugs for the use of illicit drugs, it may be that non-normative developmental progressions during adolescent, and specifically identify exploration absent of connectedness to the family, are the crucial factors in determining progression to further drug abuse by adolescents.

The first research question addressed by this project involved the relationship of family system concepts to the use of various drugs by adolescent family members. Of great interest is the amount of variance in drug use explained for the severity of drug use and the use of tobacco, alcohol and marijuana by the adolescents. The models explained slightly less than a third of the variance in marijuana use, about a quarter of the variance in overall drug use severity, slightly over a tenth of the variance in tobacco use, and roughly a twentieth of the variance in alcohol use. While the majority of the variance in drug use is not explained by these models, the large proportions explained for overall drug use severity and marijuana use attest to the importance of family system predictors of adolescent substance use.

Kandel's work on drug use sequencing and the initiation into using various drugs, as discussed in the review of literature, provides an important basis for discussion of the findings (Kandel, 1975; Kandel & Andrews, 1987). Kandel used a random sample of families with adolescent high school students from New York state in the early 1970's. Kandel's emphasis was on the sequencing of drug use and initiation into using various drugs, while this project looked solely at the frequency and severity of drug use by adolescent drug users.

The amount of variance in overall drug use severity explained by the family systems model is about 25%. Similarly, Kandel found that parental influences (including parental use, closeness of adolescent to parents, rigid parental rules, and parental disagreements) explained the largest proportion of variance in initiation into illicit drugs beyond marijuana, about 10%. In the present study, family cohesion had the largest total effect on drug use severity, at least partially supporting the idea that poorly individuated parent-child relationships (i.e., lacking connectedness) are associated with greater drug use severity. Openness of parent-adolescent communication also had a substantial, although primarily indirect effect through family cohesion, on drug use severity. It appears that there is greater drug use severity by adolescents in families possessing more closed communication among parents and adolescents, and greater feelings of emotional and

psychological distance. Change in family rules around what should and should not be discussed, and hence enhance family closeness, would produce a decline in overall drug use severity according to this model.

For tobacco use, Kandel offers no comparable data. It is clear from the findings here that the family system has a minimal impact on adolescents' ~~frequency of~~ tobacco use. The predictor with the largest total effect on tobacco use was the openness of communication between the parents and adolescent, at -.18. Tobacco use seems to covary independently of the family system as measured in this study. Family cohesion had no impact on tobacco use frequency suggesting the adolescent's individuation from their families of origin (measured by connectedness to the family) plays no role in tobacco use by the adolescent. Although not included in these models, the impact of peers on various types of drug use including marijuana use and other illicit drug use is quite substantial (Kandel, Kessler, & Marguilies, 1978), and it is possible that peers' use of tobacco explains a much larger proportion of the variance in tobacco use than does the family system variables. Parental modeling of tobacco use, also not tested here, may account for a substantial proportion of the variance.

The family systems model for adolescent alcohol use explained less variance than did the model for tobacco use ~~frequency~~. Kandel, on the other hand, was able to explain 46% of the variance in the frequency of alcohol use and only 7% of the variance in the initiation into alcohol. The reason for more variance explained in Kandel's model, compared to the family systems model, is that the number of friends using alcohol and the frequency of the best friend's use were the primary predictors of alcohol use frequency. Parent's use and attitudes towards use had only indirect effects on alcohol use frequency of the adolescents. Parents' use and peers' use were not included in the family systems models. The findings suggest that factors other than the family system predict alcohol use frequency, and, based on previous studies, peers' ~~drug~~ use may be the largest determinant.

The findings for marijuana use are quite different from those of Kandel's work. Briefly, Kandel accounted for 54% of the variance in the frequency of marijuana use, but again peers' use was most predictive, with parents' alcohol use, attitudes toward marijuana use, and closeness of parents to adolescents playing minimal roles. Yet, in the present study family cohesion had a large direct effect on marijuana use indicating that greater family disengagement is highly related to greater marijuana use. This finding lends considerable support for the notion that parent-adolescent relationships in families with adolescent marijuana users, and particularly heavy users, are pseudo-individuated with minimal connectedness across generations predictive of greater marijuana use. As with overall drug use severity, the openness of family communication predicts, directly and indirectly through family cohesion, less frequent marijuana use. Again, this suggests that changes in rules around communication, and the resulting increase in family cohesiveness, should greatly reduce marijuana use according to the model. Also, there was a trend towards greater ambiguity in intergenerational role relationships predicting less frequent marijuana use, thus supporting an argument for more flexibility in

role relationships being more functional.

Greater involvement of children in family decision-making was predictive of more frequent marijuana use. The total effect, though, is mediated by an indirect effect of the opposite direction through increased family cohesion, and thus the total effect actually is smaller than that for family cohesion. One explanation for the relationship is that democratic parenting styles are lacking in parental discipline, common in many single parent families, and such a lack in discipline leads to greater drug use including marijuana use. The negative path from parents' relationship status to "Intergenerational Democracy" does indeed suggest that families where the biological parents of the adolescent drug users are not married tend to include children in family decision-making. Yet, this explanation looses some merit when the model for overall drug use severity is considered. "Intergenerational Democracy" had a minimal and non-significant effect on overall drug use severity. If democratic parenting styles result in lax discipline of adolescent members, children making family decisions, and greater substance use, shouldn't overall severity of drug use also be higher for such families? It is suggested that, in cases of extreme marijuana use, greater input of children in family decisions is problematic, but in less severe cases "Intergenerational Democracy" may predict what is developmentally normal for many adolescent--i.e., experimental and recreational use of marijuana that is not necessarily related to other illicit drug use. Furthermore, a third variable may be operating here that accounts for the relationships between "Intergenerational Democracy" and marijuana use, such as the adolescent's tendency towards risk-taking and identity exploration evident in families that encourage such activity. Finally, it should be noted that most of the adolescents scored very low on "Intergenerational Democracy" and the scores were significantly skewed toward greater democracy. An examination of this factor for other populations is required for making comparisons with parenting styles in other families.

The fact that cohesion was negatively related to adolescent marijuana and overall drug use severity contradicts the homeostatic model of adolescent substance abuse where the parent-child dyads, and especially the mother-adolescent relationship, is over-involved or enmeshed. Yet, as stated elsewhere (Volk, Edwards, Lewis, & Sprenkle, 1989), there are two alternative explanations for the finding. First, while "outsiders" (clinician, theorists, etc...) see these families as indeed over-involved, the "insiders" feel anything but close and experience greater frustration and anger associated with the drug use. Thus, the apparent contradiction for cohesion may represent different vantage points taken by clinicians and family members. Second, it is possible that the homeostatic model is not appropriate for all adolescent drug users and types of drug abuse. Recall that much of Stanton's work was with heroin addicts. It may be that families of drug addicts are qualitatively different than those of adolescent drug users, and the notions of the homeostatic model may simply not apply.

The findings for gender suggest that further examination of the models for males and females separately is warranted. Although gender was significantly related to marijuana use, while males using marijuana more frequently, the paths from gender to each of the

drugs were positive in direction. National surveys of adolescent drug use for males and females support the conclusion (Johnston, O'Malley, & Bachman, 1988). What is not clear is whether or not any of the other demographic variables or the family systems variables interact with gender. The most powerful test of such effects would employ a multi-sample technique when sufficient numbers of male and female drug users were sampled, and comparisons were then made across models.

In summary, family system variables are predictive of illicit drug use while they tell us little about tobacco and alcohol use. Family cohesion is consistently and inversely related to overall drug use severity and marijuana use, suggesting a lack of connectedness between the adolescent drug users and families and poorly individuated relationships. Finally, the trends suggest that the openness of family communication predicts less severe drug use and marijuana use, both directly and through family cohesion.

IMPLICATIONS

The findings from this study suggest several directions for intervention-prompted changes in family functioning on adolescent licit and illicit drug use. It should be noted that this paper did not directly assess the impact of change in family functioning on adolescent drug use. Rather, the predictive value of certain family system properties on adolescent drug use was examined. It is assumed that the impact by family therapy on these family system properties would necessarily result in changes in family functioning and ultimately a decline in adolescent illicit drug use.

The findings from this project suggest several propositions for empirical evaluation:

1. Change in family cohesion, adaptability and communication has a small impact on the frequency of adolescent tobacco use.
2. Change in family cohesion, adaptability and communication has a small impact on the frequency of adolescent alcohol use.
3. Change in family cohesion, the amount of input by children in family decision-making, and openness of parent-adolescent communication causes change in the frequency of adolescent marijuana use such that:
   a) increased family cohesion results in less frequent adolescent marijuana use,
   b) movement towards moderate levels of input by children in decision-making results in less frequent adolescent marijuana use,
   c) increased openness of family communication results in increased family cohesion and less frequent adolescent marijuana use, and
   d) decreased ambiguity of across generation family roles results in less frequent adolescent marijuana use.
4. Change in family cohesion and openness of parent-adolescent communication causes change in the overall severity of adolescent drug use such that:
   a) increased family cohesion results in less severe adolescent drug use, and
   b) increased openness of family communication results in increased family cohesion and less severe adolescent drug use.

These propositions, then, can serve as the basis for developing

hypotheses about the effectiveness of the Purdue Brief Family Therapy program, or PBFT, and other family-based interventions for adolescent drug abuse and suggest directions for intervention-prompted changes in family functioning that might impact adolescent illicit drug use.

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Table 1. Demographic Characteristics of the Sample

Adolescents (N=152)	
Age:	Mean = 16.17 Stddev = 1.68 Range = 12 to 22
Gender:	Males = 122 (80.3%) Females = 30 (19.7%)
Employment Status:	
	Employed = 57 (37.5%) Not working = 95 (62.5%)
Grade in School:	
Seventh	= 7 (4.6%)
Eighth	= 19 (15.5%)
Ninth	= 18 (11.8%)
Tenth	= 26 (17.1%)
Eleventh	= 32 (16.4%)
Twelfth	= 25 (16.4%)
College	= 5 (3.3%)
Graduate School	= 5 (3.3%)
Not in school	= 15 (9.9%)
Number of Siblings and Step-siblings:	
One	= 27 (17.8%)
Two	= 28 (18.4%)
Three	= 39 (25.6%)
Four	= 26 (17.1%)
Five	= 15 (9.9%)
Six	= 3 (2.0%)
Seven	= 6 (2.0%)
Eight	= 4 (2.6%)
Eleven	= 3 (2.0%)
Religious Affiliation:	
Protestant	= 38 (25.0%)
Catholic	= 42 (27.6%)
Other	= 26 (17.1%)
Agnostic	= 7 (4.6%)
Atheist	= 3 (2.0%)
None	= 33 (21.7%)
missing	= 3 (2.0%)
Experience with Previous Counseling:	
Has had previous counseling	= 71 (46.7%)
Has not had previous counseling	= 78 (51.3%)
missing	= 3 (2.0%)

Table 1, continued.

	Mothers (n=139)	Fathers (n=68)
Age:		
Mean	41.03	44.79
Stddev	6.58	6.76
Range	25 to 65	33 to 60
Education:		
Grade School or Junior High	16 (11.7%)	6 (8.8%)
Attend High School	21 (15.3%)	7 (10.3%)
High School Graduate	60 (43.8%)	30 (44.1%)
Attended College	12 (8.8%)	8 (11.8%)
College Graduate	13 (9.5%)	9 (13.2%)
Technical Degree	6 (3.9%)	3 (4.4%)
Masters	8 (5.8%)	2 (2.9%)
Ph.D., M.D., D.DS., J.D.	1 (0.7%)	3 (4.4%)
Occupation:		
Homemaker	27 (19.4%)	0 (0.0%)
Disabled-unemployed	3 (2.2%)	4 (5.9%)
Management	9 (6.5%)	12 (17.6%)
Clerical	22 (15.8%)	0 (0.0%)
Sales	8 (5.8%)	0 (0.0%)
Skilled Craftsman	3 (2.2%)	17 (25.0%)
Professional	18 (12.9%)	13 (19.1%)
Technician	2 (1.4%)	2 (2.9%)
Foreman	0 (0.0%)	4 (5.9%)
Social Service	1 (0.7%)	0 (0.0%)
Retailer	4 (2.9%)	0 (0.0%)
Operator	10 (7.2%)	11 (16.2%)
Laborer	11 (7.9%)	0 (0.0%)
Full-time Student	2 (1.4%)	0 (0.0%)
Other	19 (13.7%)	5 (7.4%)
Marital Status:		
Single	13 (9.5%)	1 (1.5%)
Engaged	5 (3.6%)	1 (1.5%)
Married	81 (51.(%)	59 (86.8%)
Separated	4 (2.9%)	2 (2.9%)
Divorced	28 (20.4%)	3 (4.4%)
Widowed	6 (4.4%)	1 (1.5%)

Table 1, continued.

Religious Affiliation:		
Protestant	81 (58.7%)	34 (50.0%)
Catholic	38 (27.5%)	25 (36.8%)
Other	8 (5.8%)	4 (5.9%)
Agnostic	1 (0.7%)	2 (2.9%)
None	10 (7.2%)	3 (4.4%)
Residence:		
Metropolitan, within city	32 (23.9%)	7 (10.3%)
Suburban	16 (13.4%)	9 (13.2%)
Town	49 (36.6%)	29 (42.6%)
Small Town	17 (12.7%)	9 (13.2%)
Rural Area	18 (13.4%)	14 (20.9%)
Income:		
$1-$4,999	13 (10.2%)	2 (3.0%)
$5,000-$9,999	12 (9.4%)	0 (0.0%)
$10,000-$14,999	16 (12.5%)	7 (10.4%)
$15,000-$19,999	18 (14.1%)	6 (9.0%)
$20,000-$29,999	28 (21.9%)	15 (22.4%)
$30,000-$39,999	12 (9.4%)	9 (11.4%)
$40,000-$49,999	13 (10.2%)	12 (17.9%)
$50,000-$74,999	15 (11.7%)	15 (22.4%)
$75,999 +	1 (0.8%)	1 (1.5%)

Table 2. Counts and Percentages of School and Work Related Events Experience Over the Previous Four Week Period by Adolescents

Event	n	%
Disciplined by teacher/principal	38	25.0%
Received notice of failing grade(s)	31	20.4%
Expelled from school	24	15.8%
Got in fight, not at school	22	14.5%
Skipped school all day	21	13.8%
Arrested	21	13.8%
Cut some classes (not all day)	20	13.2%
Jailed	20	13.2%
Kicked out of class	17	11.2%
Got in fight at school	12	7.9%
Questioned by police	12	7.9%
In trouble at work for bad job performance	5	3.3%
Fired from job	3	2.0%
Got in fight at work	1	.7%

Table 3. Drug Use Data for Adolescents (Percentages for each Drug or Class of Drugs), N = 151

Drug or Class of Drugs	Frequency of Use Over the Last Four Weeks						
	0	1-2	3-5	6-9	10-19	20-39	40+
Hallucinogens	88.7	7.9	2.0	0.7	0.7	0.0	0.0
Stimulants	83.4	9.3	3.3	2.0	0.7	0.0	1.3
Cocaine	91.4	6.0	0.0	0.7	0.7	0.7	0.7
Amyl or Butyl Nitrite	87.4	6.6	2.6	1.3	1.3	0.0	0.7
Barbiturates	96.0	1.3	2.0	0.0	0.0	0.0	0.7
Other Downers	89.4	8.6	1.3	0.7	0.0	0.0	0.0
Alcohol	25.8	29.1	16.6	9.9	8.6	3.3	6.6
Tranquilizers	90.7	6.6	1.3	0.7	0.0	0.7	0.0
Heroin	98.0	1.3	0.7	0.0	0.0	0.0	0.0
Methadone	100.0	0.0	0.0	0.0	0.0	0.0	0.0
Other Opiates	98.7	0.7	0.7	0.0	0.0	0.0	0.0
Phencycladine	96.7	2.0	0.7	0.7	0.0	0.0	0.0
Inhalants	92.7	4.0	2.0	0.7	0.7	0.0	0.0
Tobacco	31.8	7.3	4.6	2.6	5.3	2.6	45.7
Marijuana	37.7	20.5	7.9	10.6	7.3	2.0	13.9

Drug Use Groups:

Non-users:	n = 26	% = 17.2
Soft Drug Users:	n = 77	% = 51.0
Hard Drug Users:	n = 48	% = 31.8

Table 4. Univariate Descriptives for All Observed Variables Included in Analyses

Variable	n	mean	median	stddev	min	max	skew	kurtosis
Age	111	16.1	16.0	1.66	12	21	.01	.25
Gender	111	.8	1.0	.40	0	1	-1.54	.36
Strength of Religious Beliefs	111	3.1	3.0	.91	1	5	.11	-.56
Parents' Relationship Status	111	.4	0.0	.49	0	1	.37	-1.89
Income	111	5.1	5.0	2.01	1	9	-.31	-.66
Cohesion	111	28.1	29.0	8.65	10	47	-.14	-.67
Adaptability: Item 2	111	2.2	2.0	1.04	1	5	.54	-.24
Adaptability: Item 4	111	2.2	2.0	1.26	1	5	.80	-.42
Adaptability: Item 10	111	2.2	2.0	1.25	1	5	.81	-.33
Adaptability: Item 12	111	1.6	1.0	.92	1	5	1.31	1.08
Adaptability: Item 18	111	2.0	1.0	1.35	1	5	1.02	-.18
Adaptability: Item 20	111	2.4	2.0	1.30	1	5	.55	-.75
Open Family Communication with Mother	111	31.9	33.0	10.23	10	50	-.26	-.68
Open Family Communication with Father	111	29.0	29.0	10.1	10	50	.08	-.82

Table 4, continued.

Variable	n	mean	median	stddev	min	max	skew	kurtosis
Problem Family Communication with Mother	111	31.1	32.0	7.75	10	48	-.31	-.20
Problem Family Communication with Father	111	31.3	33.0	7.86	10	47	-.47	-.25
Alcohol Use	111	1.7	1.0	1.66	0	6	1.11	.62
Tobacco Use	111	2.9	3.0	2.72	0	6	.07	-1.85
Marijuana Use	111	1.6	1.0	2.01	0	6	1.19	.19
Drug Use Severity	111	195.9	195.4	47.30	100	301.3	-.32	-.08

Table 5. Severity and Frequency Weights for Index of Drug Severity Computation

Drug Severity Weights	
Tobacco	1
Alcohol	2
Marijuana	2
Stimulants	3
Amyl and Butyl Nitrite	3
Cocaine	4
Barbiturates	4
Other Downers	4
Tranquilizers	4
Heroin	4
Other Opiates	4
Inhalants	4
Phencycladine	4
Frequency Weights	
Zero times	0
1-2 times	1
3-5 times	2
6-9 times	3
10-19 times	4
20-39 times	5
40 or more times	6

Table 6. Reliability Estimates for Single Indicators (n=111)

Indicator	mean	variance	Estimated Proportion	
			Unreliable Variance	Reliable Variance
Age	16.17	2.82	0%	100%
Gender	.80	.16	0%	100%
Strength of Religious Beliefs	3.00	.83	5%	95%
Parents' Relationship Status	.41	.24	3%	97%
Family Income	4.56	4.75	11%	89%
Open Family Communication with Mother	32.38	107.73	10%	90%
Open Family Communication with Father	29.00	104.07	10%	90%
Problem Family Communication with Mother	30.94	59.01	25%	75%
Problem Family Communication with Mother	31.33	62.72	25%	75%
Cohesion	28.24	74.01	15%	85%
Drug Use Severity	201.94	2160.04	20%	80%
Tobacco Use	4.33	7.41	10%	90%
Alcohol Use	2.83	3.12	15%	85%
Marijuana Use	2.91	4.54	15%	85%

Table 7. Indicators of Fit for Models of Drug Use Severity

	LISREL Fit Indicators						Normed Fit Indices		Nested Model Comparisons			
Model	χ^2	d.f.	p	GFI	AGFI	RMSR	NFI	INFI	Compared to model	$\Delta\chi^2$	Δd.f.	p
Null	532.72	153	.000	.584	.584	.199	--	--	--	--	--	--
Informed Null	428.17	118	.000	.668	.570	.183	.196	--	--	--	--	--
(1) Proposed Model	155.33	107	.002	.868	.811	.102	.708	.637	--	--	--	--
(2) BE(1,2) freed	142.00	106	.011	.877	.823	.099	.733	.668	(1)	13.33	1	.000
(3) BE(3,2) freed	134.60	105	.027	.885	.832	.095	.747	.686	(2)	7.40	1	.007
(4) GA(2,4) freed	124.09	104	.087	.893	.843	.083	.767	.710	(3)	10.51	1	.001
(5) GA(1,3) freed	116.34	103	.174	.897	.847	.080	.782	.728	(4)	7.75	1	.005
(6) PH(6,1) freed	111.30	102	.249	.902	.853	.076	.790	.740	(5)	5.04	1	.025
Parsimonious	111.93	104	.280	.901	.854	.076	.790	.739	--	--	--	--

Note. The following notation is used above:

GFI = Goodness of Fit Index
AGFI = Adjusted Goodness of Fit Index
RMSR = Root Mean Square Residual
p = p-value
NFI = Normed Fit Index
INFI = Informed Normed Fit Index
$\Delta\chi^2$ = Change in chi-square
Δd.f. = Change in degrees of freedom

Table 8. Indicators of Fit for Models of Tobacco Use

	LISREL Fit Indicators						Normed Fit Indices		Nested Model Comparisons			
Model	χ^2	d.f.	p	GFI	AGFI	RMSR	NFI	INFI	Compared to model	$\Delta\chi^2$	Δd.f.	p
Null	518.50	153	.000	.590	.590	.196	--	--	--	--	--	--
Informed Null	420.99	118	.000	.670	.572	.181	.188	--	--	--	--	--
(1) Proposed Model	151.51	107	.003	.870	.815	.100	.708	.640	--	--	--	--
(2) BE(1,2) freed	137.97	106	.020	.880	.827	.097	.734	.672	(1)	13.59	1	.000
(3) BE(3,2) freed	130.55	105	.046	.888	.837	.093	.748	.690	(2)	7.37	1	.007
(4) GA(2,4) freed	119.84	104	.137	.896	.847	.081	.769	.715	(3)	10.71	1	.001
(5) GA(1,3) freed	112.12	103	.254	.900	.851	.079	.784	.734	(4)	7.74	1	.005
(6) PH(6,1) freed	107.08	102	.346	.905	.858	.075	.793	.746	(5)	5.04	1	.025
Parsimonious	107.35	104	.391	.904	.859	.075	.793	.745	--	--	--	--

Note. The following notation is used above:

GFI = Goodness of Fit Index
AGFI = Adjusted Goodness of Fit Index
RMSR = Root Mean Square Residual
p = p-value
NFI = Normed Fit Index
INFI = Informed Normed Fit Index
$\Delta\chi^2$ = Change in chi-square
Δd.f. = Change in degrees of freedom

Table 9. Indicators of Fit for Models of Alcohol Use

	LISREL Fit Indicators						Normed Fit Indices		Nested Model Comparisons			
Model	χ^2	d.f.	p	GFI	AGFI	RMSR	NFI	INFI	Compared to model	$\Delta\chi^2$	Δd.f.	p
Null	514.98	153	.000	.591	.591	.196	--	--	--	--	--	--
Informed Null	423.19	118	.000	.670	.572	.181	.178	--	--	--	--	--
(1) Proposed Model	150.54	107	.004	.871	.816	.100	.708	.644	--	--	--	--
(2) BE(1,2) freed	137.09	106	.023	.880	.826	.097	.734	.676	(1)	13.45	1	.000
(3) BE(3,2) freed	129.66	105	.052	.888	.837	.093	.748	.694	(2)	7.43	1	.006
(4) GA(2,4) freed	119.01	104	.149	.896	.847	.081	.769	.719	(3)	10.65	1	.001
(5) GA(1,3) freed	111.27	103	.272	.900	.852	.079	.784	.737	(4)	7.74	1	.005
(6) PH(6,1) freed	106.24	102	.367	.905	.858	.075	.794	.749	(5)	5.03	1	.025
Parsimonious	106.54	104	.467	.904	.862	.075	.793	.748	--	--	--	--

Note. The following notation is used above:

GFI = Goodness of Fit Index
AGFI = Adjusted Goodness of Fit Index
RMSR = Root Mean Square Residual
p = p-value
NFI = Normed Fit Index
INFI = Informed Normed Fit Index
$\Delta\chi^2$ = Change in chi-square
Δd.f. = Change in degrees of freedom

Table 10. Indicators of Fit for Models of Marijuana Use

	LISREL Fit Indicators						Normed Fit Indices		Nested Model Comparisons			
Model	χ^2	d.f.	p	GFI	AGFI	RMSR	NFI	INFI	Compared to model	$\Delta\chi^2$	Δd.f.	p
Null	526.93	153	.000	.589	.589	.197	--	--	--	--	--	--
Informed Null	419.52	118	.000	.671	.573	.186	.204	--	--	--	--	--
(1) Proposed Model	147.53	107	.006	.874	.819	.101	.720	.648	--	--	--	--
(2) BE(1,2) freed	134.28	106	.033	.883	.832	.097	.745	.680	(1)	13.25	1	.000
(3) BE(3,2) freed	126.79	105	.073	.891	.841	.093	.759	.698	(2)	7.49	1	.006
(4) GA(2,4) freed	116.41	104	.191	.899	.851	.081	.779	.723	(3)	10.38	1	.001
(5) GA(1,3) freed	108.83	103	.333	.903	.856	.079	.793	.741	(4)	7.58	1	.006
(6) PH(6,1) freed	103.59	102	.437	.908	.862	.075	.803	.753	(5)	5.24	1	.022
Parsimonious	103.97	105	.510	.907	.865	.075	.803	.752	--	--	--	--

Note. The following notation is used above:

GFI = Goodness of Fit Index
AGFI = Adjusted Goodness of Fit Index
RMSR = Root Mean Square Residual
p = p-value
NFI = Normed Fit Index
INFI = Informed Normed Fit Index
$\Delta\chi^2$ = Change in chi-square
Δd.f. = Change in degrees of freedom

Table 11. Decomposition of Effects of Predictors Variables on Indicators of Drug Use

Variable	Total Effect	Direct Effect	Indirect Effect
Drug Use Severity			
Exogenous:			
Age	.118	.113	.005
Gender	.088	.088	.000
Strength of Religious Beliefs	.107	.186	-.079
Parents' Relationship Status	-.065	-.082	.017
Income	-.105	-.105	.000
Open Family Communication	-.300	-.069	-.231
Problem Family Communication	.093	.167	-.074
Endogenous:			
Cohesion	-.400	-.400	.000
Intergenerational Democracy	-.070	.061	-.131
Hierarchical Ambiguity	.100	.100	.000
Tobacco Use Severity			
Exogenous:			
Age	.121	.111	.010
Gender	.061	.061	.000
Strength of Religious Beliefs	.132	.132	.000
Parents' Relationship Status	-.045	-.078	.033
Income	-.110	-.110	.000
Open Family Communication	-.182	-.128	-.054
Problem Family Communication	.109	.096	.013
Endogenous:			
Cohesion	.000	.000	.000
Intergenerational Democracy	-.141	-.094	-.047
Hierarchical Ambiguity	-.092	-.092	.000

Table 11, continued.

Alcohol Use Severity			
Variable	Total Effect	Direct Effect	Indirect Effect
Exogenous:			
Age	.106	.102	.004
Gender	.061	.061	.000
Strength of Religious Beliefs	-.022	.000	-.022
Parents' Relationship Status	.065	.054	.011
Income	-.128	-.128	.000
Open Family Communication	-.194	-.119	-.075
Problem Family Communication	-.092	-.076	-.016
Endogenous:			
Cohesion	-.111	-.111	.000
Intergenerational Democracy	-.050	.000	-.050
Hierarchical Ambiguity	.000	.000	.000

Marijuana Use Severity			
Variable	Total Effect	Direct Effect	Indirect Effect
Exogenous:			
Age	.082	.109	-.027
Gender	.191	.191	.000
Strength of Religious Beliefs	-.044	.071	-.115
Parents' Relationship Status	-.002	.084	-.086
Income	.000	.000	.000
Open Family Communication	-.200	-.135	-.065
Problem Family Communication	.002	.000	.002
Endogenous:			
Cohesion	-.585	-.585	.000 ~~-.585~~
Intergenerational Democracy	.363	.711	-.348
Hierarchical Ambiguity	-.195	-.195	.000

Table 12. Standardized Parameter Estimates from Structural and Measurement Models for each Drug Use Model

Coefficient	Model: Overall Drug Use Severity	Tobacco Use	Alcohol Use	Marijuana Use
Beta (paths between endogenous concepts):				
1,2	.385	.385	.384	.378
3,2	.489	.455	.455	.449
4,1	-.396	---	-.108	-.570
4,2	.051	-.074	---	.605
4,3	.087	-.081	---	-.182
Gamma (paths from exogenous to endogenous concepts):				
1,3	.214	.214	.214	.215
1,6	.484	.485	.486	.489
1,7	.117	.119	.119	.112
2,1	-.096	-.095	-.095	-.095
2,4	-.305	-.307	-.306	-.301
2,6	.601	.601	.601	.599
2,7	.067	.063	.063	.072
3,6	-.176	-.158	-.158	-.155
3,7	-.221	-.223	-.223	-.229
4,1	.125	.116	.111	.119
4,2	.098	.064	.066	.208
4,3	.201	.134	---	.076
4,4	-.089	-.081	.057	.090
4,5	-.110	-.108	-.131	---
4,6	-.072	-.126	-.122	-.139
4,7	.157	.085	-.070	---
Psi (unexplained endogenous variances):				
1,1	.398	.398	.398	.402
2,2	.581	.580	.580	.588
3,3	.774	.794	.794	.797
4,4	.761	.889	.931	.699
Phi (correlations among exogenous concepts):				
5,4	.208	.208	.208	.207
6,1	.198	.198	.198	.198
7,6	-.334	-.333	-.333	-.334

Table 12, continued.

Coefficient	Model: Overall Drug Use Severity	Tobacco Use	Alcohol Use	Marijuana Use
Lambda y (factor loadings for endogenous indicators):				
1,1	.894	.894	.894	.894
2,2	.755	.754	.757	.780
3,2	.554	.556	.554	.554
4,2	.636	.640	.639	.617
5,3	.783	.850	.849	.859
6,3	.368	.328	.331	.320
7,3	.391	.374	.371	.368
8,4	.894	.949	.922	.922
Lambda x (factor loading for exogenous indicators):				
1,1	1.000	1.000	1.000	1.000
2,2	1.000	1.000	1.000	1.000
3,3	.975	.975	.975	.975
4,4	.985	.985	.985	.985
5,5	.943	.943	.943	.943
6,6	.945	.946	.945	.945
7,6	.952	.951	.952	.952
8,7	.847	.847	.848	.847
9,7	.867	.866	.865	.866
Theta Epsilon (correlations among endogenous indicator residuals):				
6,2	-.228	-.220	-.221	-.227
Theta Delta (correlations among exogenous indicator residuals):				
7,6	-.200	-.201	-.200	-.200
9,6	.126	.124	.124	.127
Goodness-of-fit				
Chi-square	111.93	107.35	106.54	103.97
degrees of freedom	104	014	106	105
GFI	.901	.904	.904	.907
AGFI	.854	.859	.862	.865
RMSR	.076	.075	.075	.075
R for drug	.239	.111	.069	.301

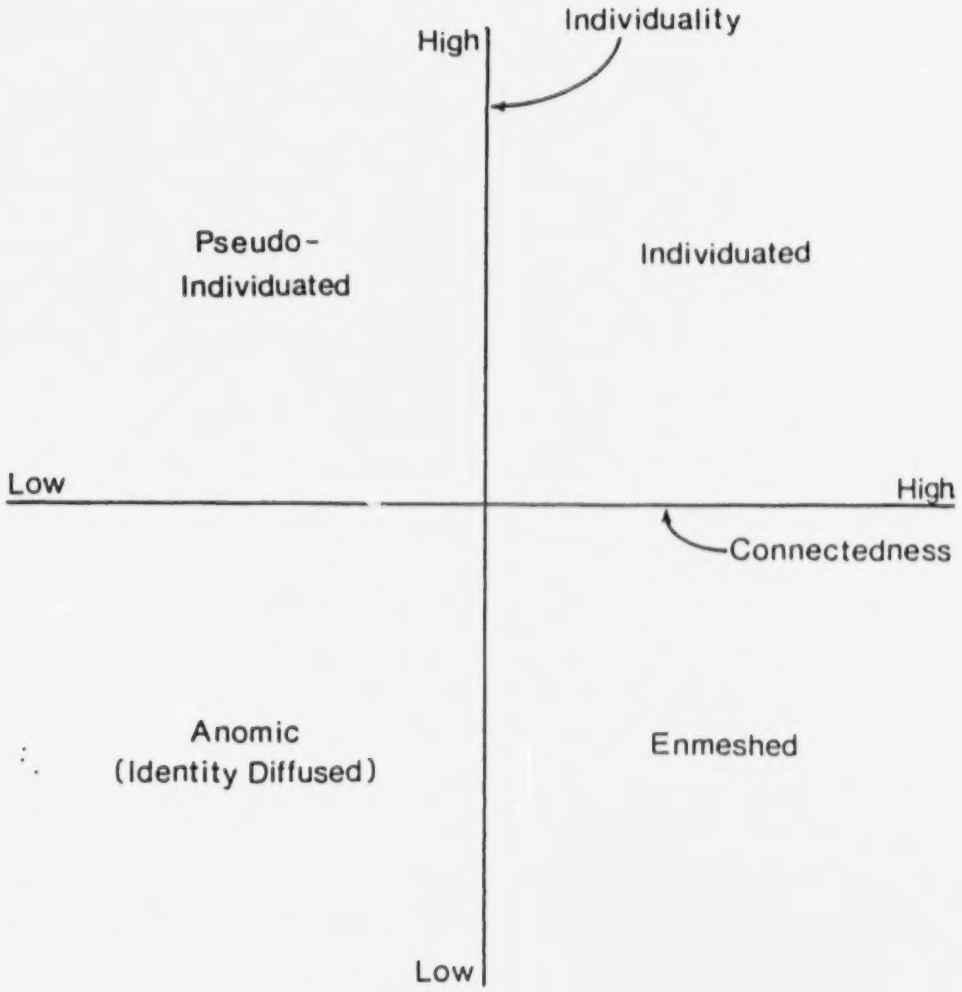

Figure 1. Conceptual Model of Adolescent Individuation

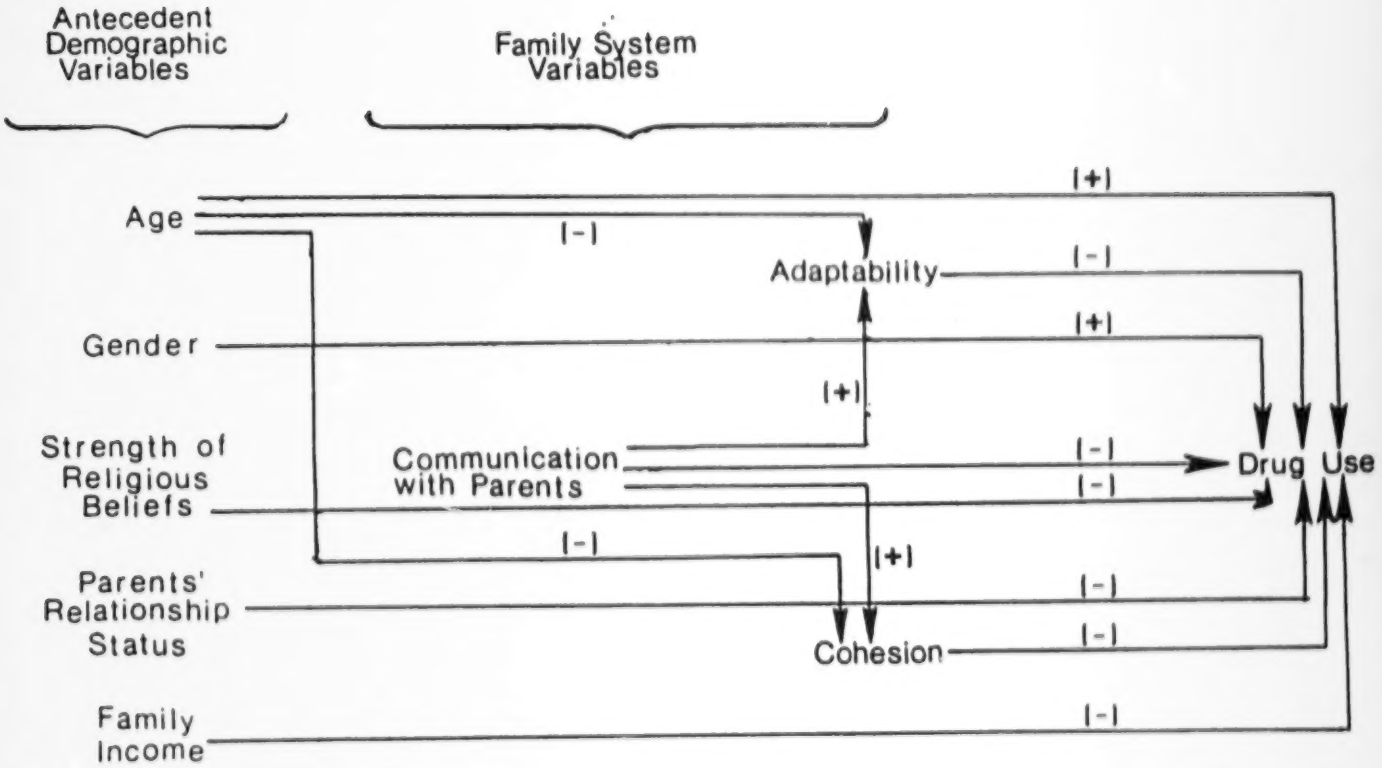

Figure 2. Family Systems Model of Adolescent Drug Abuse

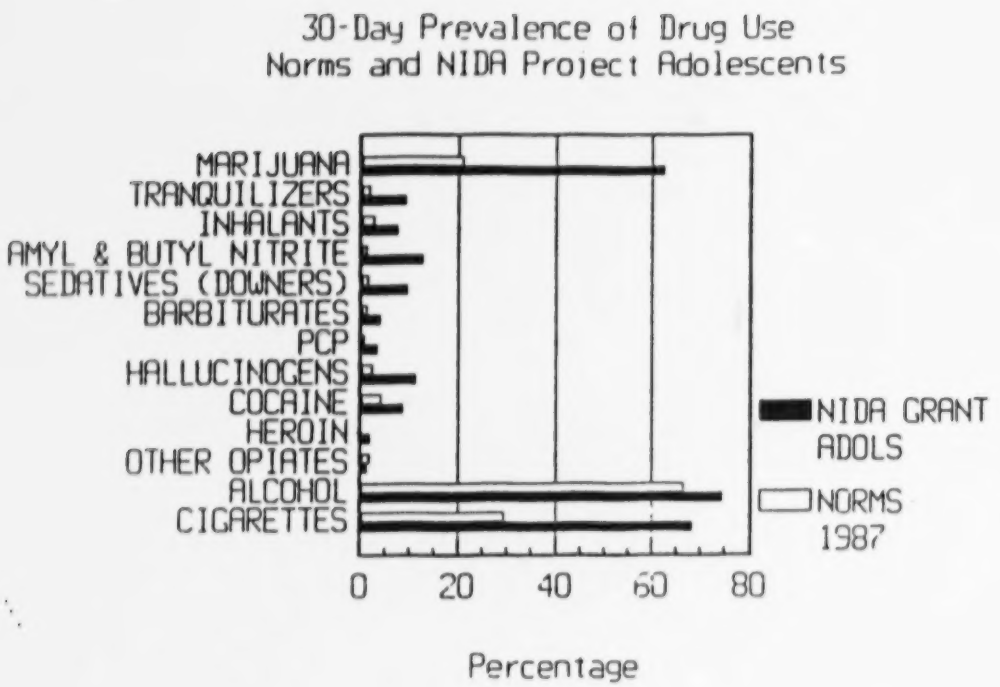

Figure 3. Thirty-day Prevalence of Drug Use: Norms and NIDA Project Adolescents

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Factor 1: Intergenerational Democracy

In solving problems, the children's suggestions are followed (2).

Children have a say in discipline (4).

Parent(s) and children discuss punishment together (10).

Factor 2: Hierarchical Ambiguity/Clarity

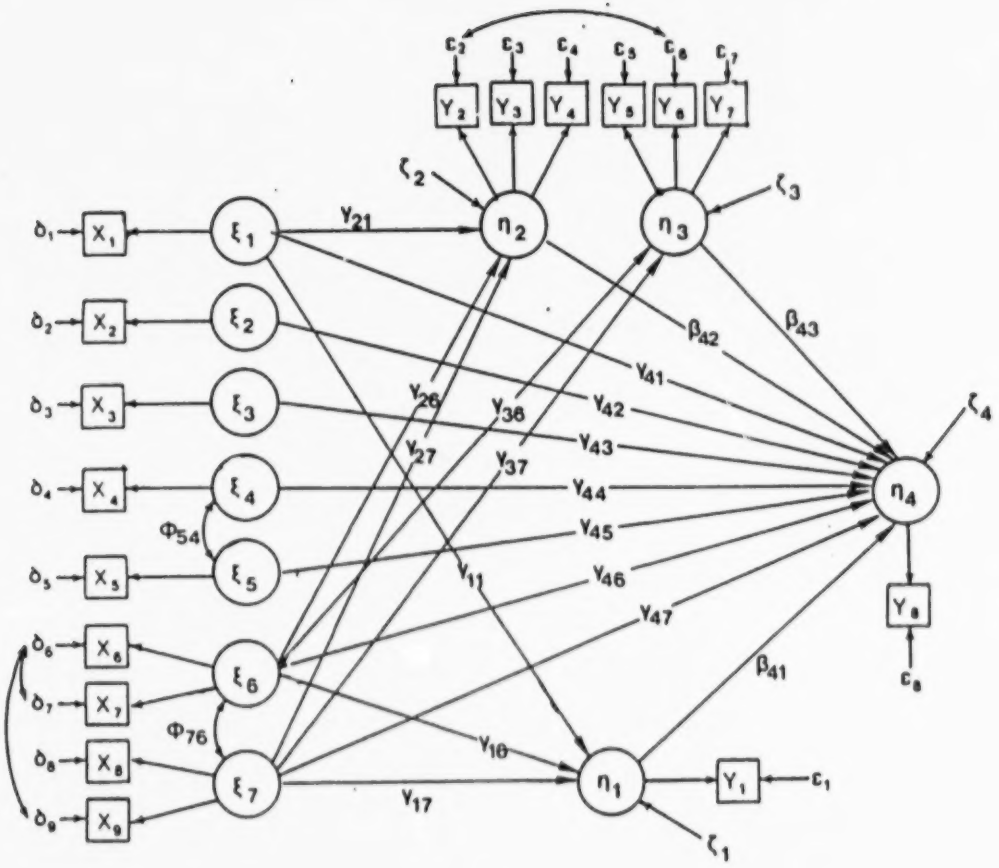
The children make the decisions in our family (12).

It is hard to identify the leaders in our family (18).

It is hard to tell who does which household chores (20).

Note. Item numbers are given in parentheses. Scores on a five-point Likert scale range from 1 "almost never," to 5 "almost always."

Figure 4. Items from Adaptability Factors



Key: ξ_1 Age
ξ_2 Gender
ξ_3 Strength of Religious Beliefs
ξ_4 Parents' Relationship Status
ξ_5 Family Income
ξ_6 Open Family Communication
ξ_7 Problem Family Communication
η_1 Family Cohesion
η_2 Intergenerational Democracy
η_3 Hierarchical Ambiguity
η_4 Drug Use

Figure 5. LISREL Model of Adolescent Drug Abuse

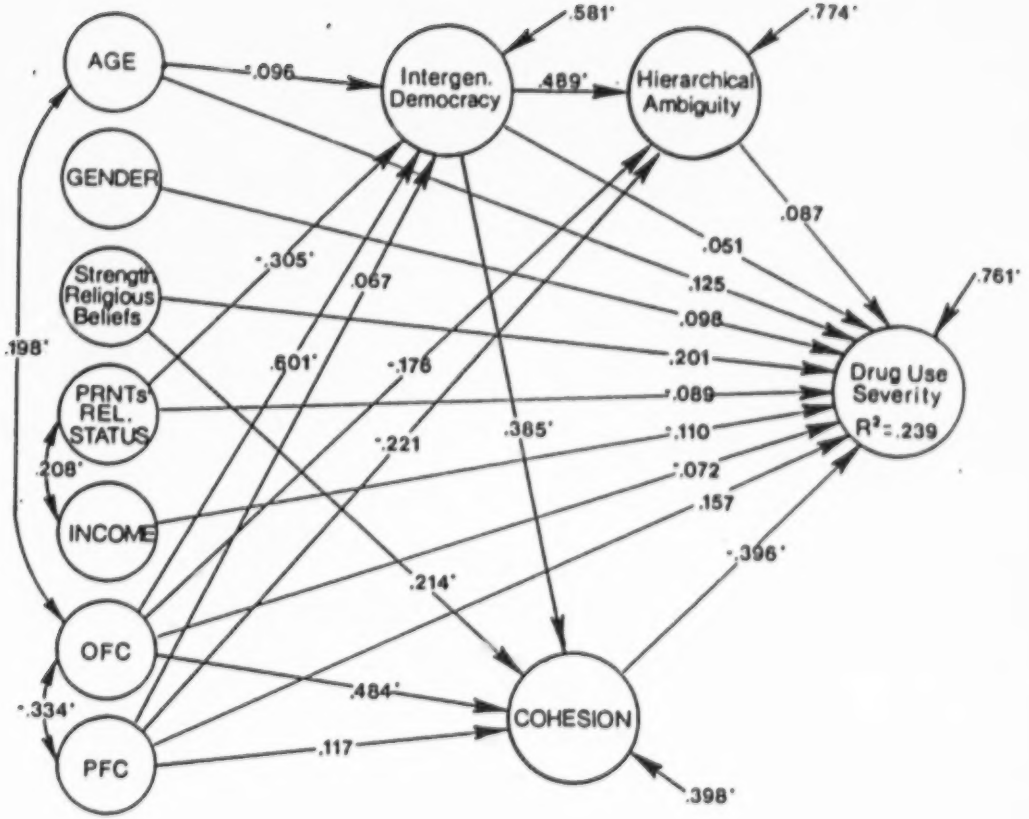


Figure 6. Path Model for Adolescent Drug Use Severity (estimates are standardized)

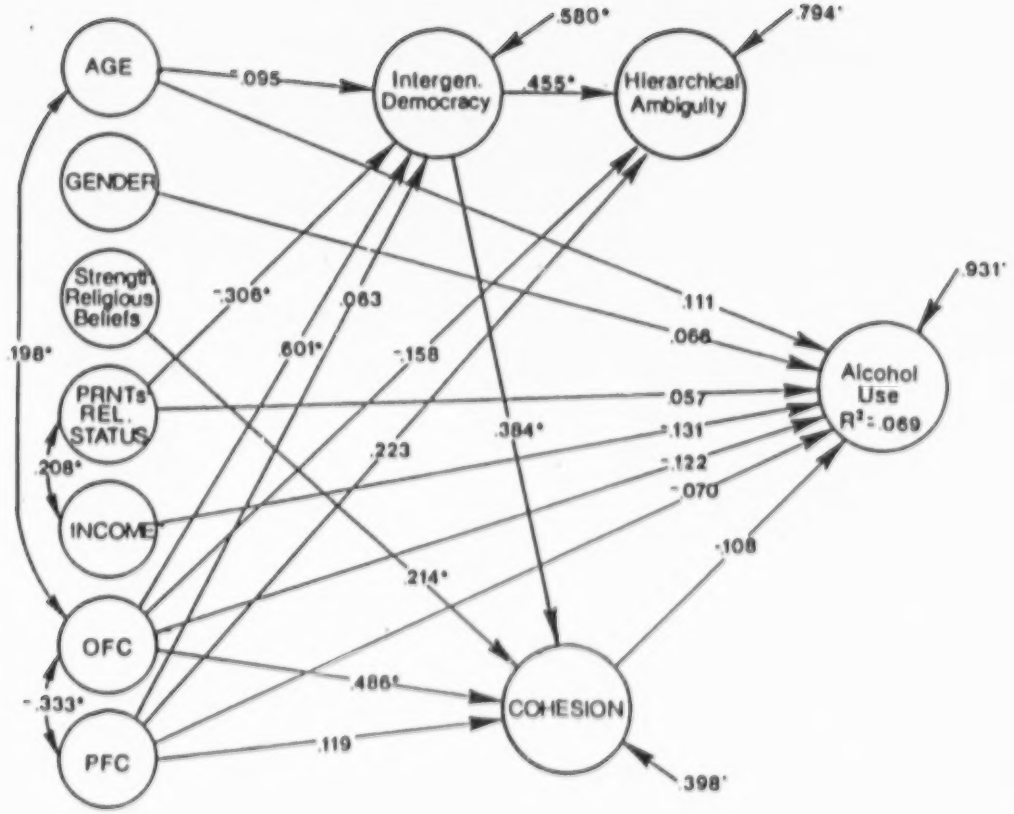


Figure 8. Path Model for Adolescent Alcohol Use (estimates are standardized)

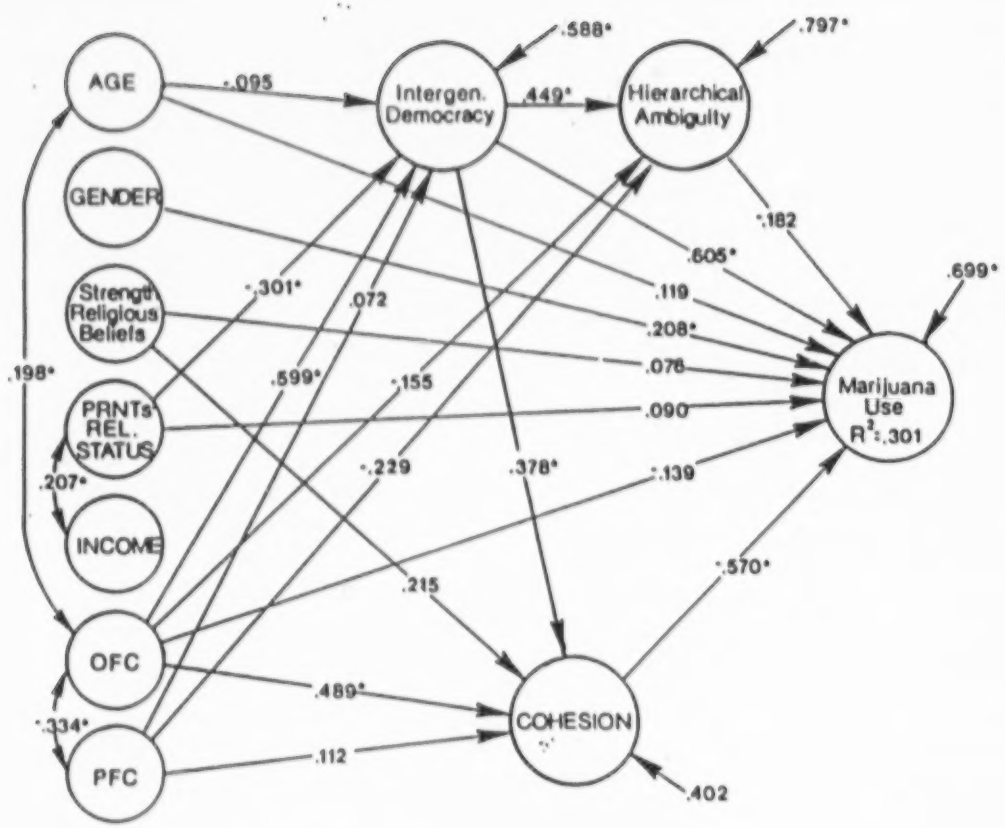


Figure 9. Path Model for Adolescent Marijuana Use (estimates are standardized)